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ORIGINAL ARTICLE/ARTICLE ORIGINAL

Activation of wicket spikes by REM sleep

Activation des pointes en palissade lors du sommeil paradoxal

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KEYWORDS
Wicket spikes;
REM sleep;
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Summary
Introduction. — Wicket spikes consist of monophasic arciform waveforms seen over the temporal regions, either bilaterally or independently over the two hemispheres. They should not be misinterpreted as epileptic abnormalities. They are usually found during light NREM sleep or drowsiness. In this study, we report an activation of wicket spikes by REM sleep.
Methods. — Two patients underwent 48-hour video-EEG. Their sleep macrostructure was analyzed. The presence of wicket spikes was correlated to each specific sleep stage.
Results. — In one case, wicket spikes appeared exclusively during REM sleep. In another patient, although wicket spikes were present throughout all sleep stages, their frequency was much higher during REM sleep (64% during REM sleep, 22% during light NREM sleep, 14% during drowsiness).
Discussion. — This study highlights that wicket spikes may be present exclusively during REM sleep and that this stage of sleep can activate them. This para-physiological rhythm, when first described, was linked to drowsiness and light NREM sleep. The persistence of wicket spikes during REM sleep has been only recently described and an increase in their frequency during this sleep stage has never been previously observed.

MOTS CLÉS
Pointes en palissade ;
Sommeil paradoxal ;
EEG

Résumé
Introduction. — Les pointes en palissade correspondent à des ondes monophasiques arciformes survenant soit de façon bilatérale ou indépendante au niveau des deux régions temporales. Elles ne doivent pas être faussement interprétées comme des anomalies épileptiques. Elles sont habituellement observées lors de la somnolence ou en sommeil lent léger. Dans cette étude, nous rapportons une activation des pointes en palissades lors du sommeil paradoxal.

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Méthodes. — Deux patients ont bénéficié d'un enregistrement EEG-vidéo de 48 heures. L'architecture du sommeil a été analysée. La présence de pointes en palissade a été corrélée à chaque stade de sommeil.
Résultats. — Dans un cas, les pointes en palissade apparaissaient exclusivement en sommeil paradoxal. Chez le second patient, les pointes en palissade étaient présentes au cours de tous les stades de sommeil mais leur fréquence était plus élevée en sommeil paradoxal (64 % en sommeil paradoxal, 22 % en sommeil lent léger et 14 % à la somnolence).
Discussion. — Cette étude souligne que les pointes en palissade peuvent être présentes presque exclusivement en sommeil paradoxal et que ce stade de sommeil peut les activer. Ce rythme paraphysiologique, lorsqu'il a été décrit a été associé à la somnolence et au sommeil lent léger. Plus tardivement, sa persistance en sommeil paradoxal a été observée. Une augmentation dans ce stade de sommeil n'avait jamais été rapportée.

Introduction

Wicket spikes consist of intermittent runs of monophasic arciform waveforms or single spike-like waveforms that are seen primarily over the temporal regions [5]. They can occur bilaterally or independently over both temporal regions. They have a frequency of 6—11 Hz and amplitude ranging from 60 to 200 μV [10]. They correspond to a normal variant activity and should not be considered as interictal abnormalities [1,5]. Wicket spikes were first considered to be a pattern associated with drowsiness and light NREM sleep [9]. In 2003, we reported five observations with the persistence of this activity during REM sleep [3]. We report here two other cases of wicket spikes activated by REM sleep.

Patients and methods

The present study included two patients who underwent a 48-hour video-EEG. As the international 10/20 system neglects the anterior and inferior temporal pole, we systematically used additional temporal electrodes. T1 and T2 are placed 1 cm above and one third of the distance along the line from the external auditory meatus to the lateral canthus of the eye. TA1 and TA2 (Temporal-Anterior) are placed 1 cm above and two third of the same distance anterior to the auditory canal [2,7]. The electrodes are glued directly onto the scalp. Polygraphy with deltoid muscles was added. No sleep inducing medication was used.

Sleep macrostructure was evaluated using the criteria of Rechtschaffen and Kales (1968) [4]. The following sleep macrostructure parameters were obtained: sleep onset latency (SL): elapsed time between lights off and the first appearance of stable sleep (3 consecutive epochs of stage 1 or the first of any other stage); total sleep time (TST): the time from sleep onset to the end of sleep minus wakefulness after sleep onset (WASO); WASO: the time spent awake between sleep onset and the end of sleep; sleep efficiency (SE): the percentage ratio between TST and time in bed; number of awakenings; total duration (expressed in minutes and in percentage of the TST) of sleep stages 1 (S1) and 2 (S2), of slow wave sleep (SWS) and of rapid eye movement (REM) sleep; latency of sleep stages 1 (S1-L) and 2 (S2-L), of SWS (SWS-L) and of REM sleep (REM-L). REM sleep was identified by its characteristic grapho-elements, that is, low voltage tracing with beta rhythms over the anterior region, muscle twitches, sawtooth waves, REM being clearly detectable at TA2 and TA1 due to eye proximity.

EEG analysis included visual identification of wicket spikes. Several presentations of wicket spikes can occur in the same patient. If taken alone, a very contoured waveform can be mistaken for an ''epileptic'' spike. However, the same element, when seen in longer runs, can be easily recognized as a wicket spike. Single sharp waves, short or longer runs were counted as individual wicket spikes and correlated to the sleep stage.

Observations

Case 1

A 25-year-old right-handed woman with a history of febrile seizures and migraine was referred for assessment of nocturnal episodes characterized by epigastric ascending sensation and nausea. These feelings would awaken her during the night, followed by a feeling of vertigo and then loss of consciousness for about 1 min. Déjà-vu and motor automatisms did not occur. Sometimes, she might have paraphasias in the postictal period. Clinical examination was normal. EEG recordings showed a normal alpha rhythm, responsive to eye opening and rare interictal diffuse sharp waves during NREM sleep. Analysis of nocturnal sleep demonstrated a normal organization and the presence of all physiological elements. The sleep analysis was: SE 86%; SL 42.5 min; TST 542.5 min; S1 7.6%; S2 57%; SWS 14.4%; REM 21%. Wicket spikes were seen during drowsiness, light NREM sleep and especially REM sleep. The prevalence for each sleep stage was as follow: 64% during REM sleep, 22% during light NREM sleep, 14% during drowsiness (Figs. 1 and 2). Morphology, frequency, amplitude and location remained identical throughout different stages. Although the location remained always temporal, predominance in the left temporal region was observed (64.7% vs. 35.3%). For this patient, a diagnosis of temporal lobe epilepsy was proposed.

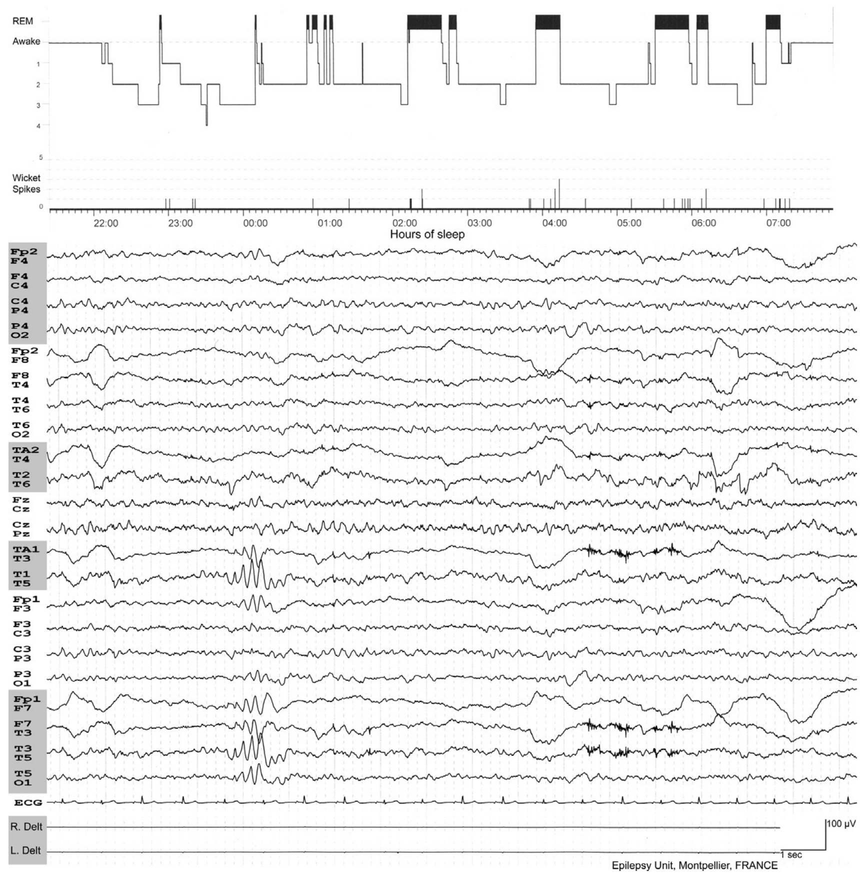

Figure 1 Hypnogram. The prevalence of wicket spikes is: 64% during REM sleep, 22% during light NREM sleep, 14% during drowsiness. EEG with international 10—20 electrode system with supplementary anterior/inferior temporal electrodes (TA1, T1, TA2, T2); right deltoid; left deltoid. The patient is in REM sleep. The tracing includes rapid eye movements clearly detectable with the fronto-polar derivations, sawtooth waves on the vertex with irregular theta-like waveforms and muscle twitches visible on the left temporal derivations. Over the left temporal region, wicket spikes can be observed.

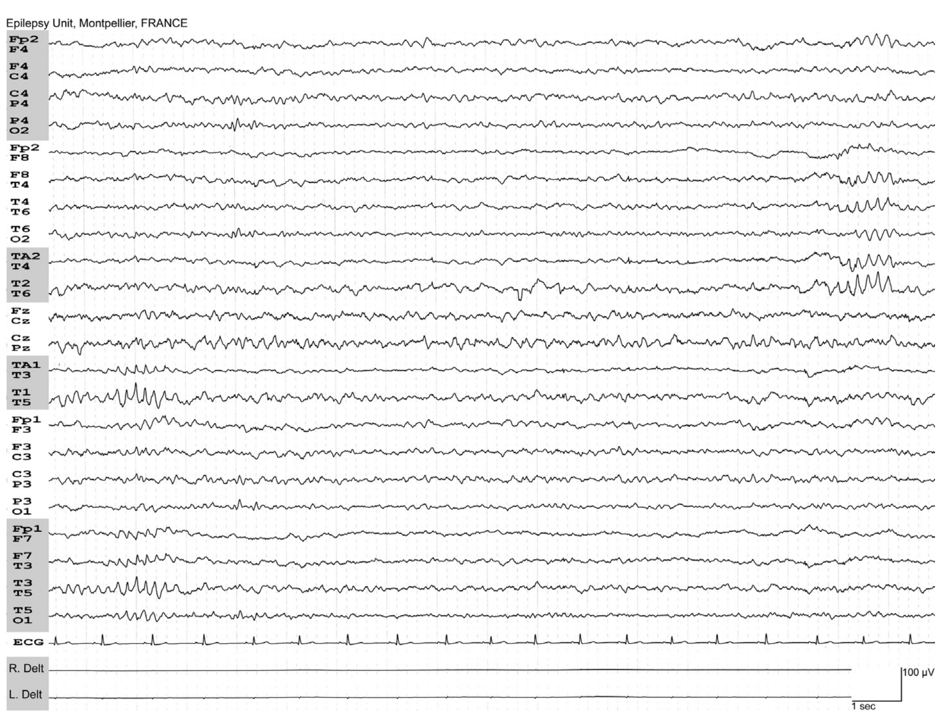

Figure 2 Same patient as on Fig. 1. REM sleep with wicket spikes over the left and right temporal regions.

Case 2

A 47-year-old right-handed woman without significant personal or family history was referred for an evaluation of episodes characterized by myoclonic jerks of the right leg that might occasionally spread to the entire body. They appeared at drowsiness and disappeared during sleep. They were triggered by stress. Valproate was ineffective. Clinical examination was normal. The EEG showed normal alpha rhythm, responsive to eye opening. No epileptiform abnormalities were detected. Myoclonic jerks appeared during photic stimulation and were clearly non-epileptic. Sleep was well organized and all physiological elements of sleep were observed. The sleep analysis was: SE 71%; SL 63.5 min; TST 379.5 min; S1 9.6%; S2 36.5%; SWS 25.4%; REM 28.5%. Wicket spikes were seen exclusively during REM sleep (Figs. 3 and 4). Morphology, frequency, amplitude and location remained identical in all REM sleep stages. No difference between the left and the right temporal location was observed. A diagnosis of psychogenic non-epileptic seizures was retained.

Discussion

In patients undergoing routine EEG recordings, it has been found that wicket spikes occur in 0.04% of the total eligible subjects [6]. However, the frequency is higher because this activity generally occurs during drowsiness and light NREM sleep; thus, prolonged EEGs are required. Recently, Vallabhaneni et al. (2013) found wicket spikes in about 10% of patients who underwent prolonged EEG-video [8].

Wicket spikes disappear during deep sleep and, in our experience, re-appear during REM sleep with a similar morphology and at slightly lower amplitude [3]. In this paper, we have outlined how they may be, not only present in REM sleep, but also activated by this stage. In our two patients, we observed an increased prevalence of wicket spikes throughout REM sleep and in one of the two patients, wicket spikes seemed to appear only during REM sleep (Case 2).

In conclusion, wicket spikes may be present exclusively in REM sleep.

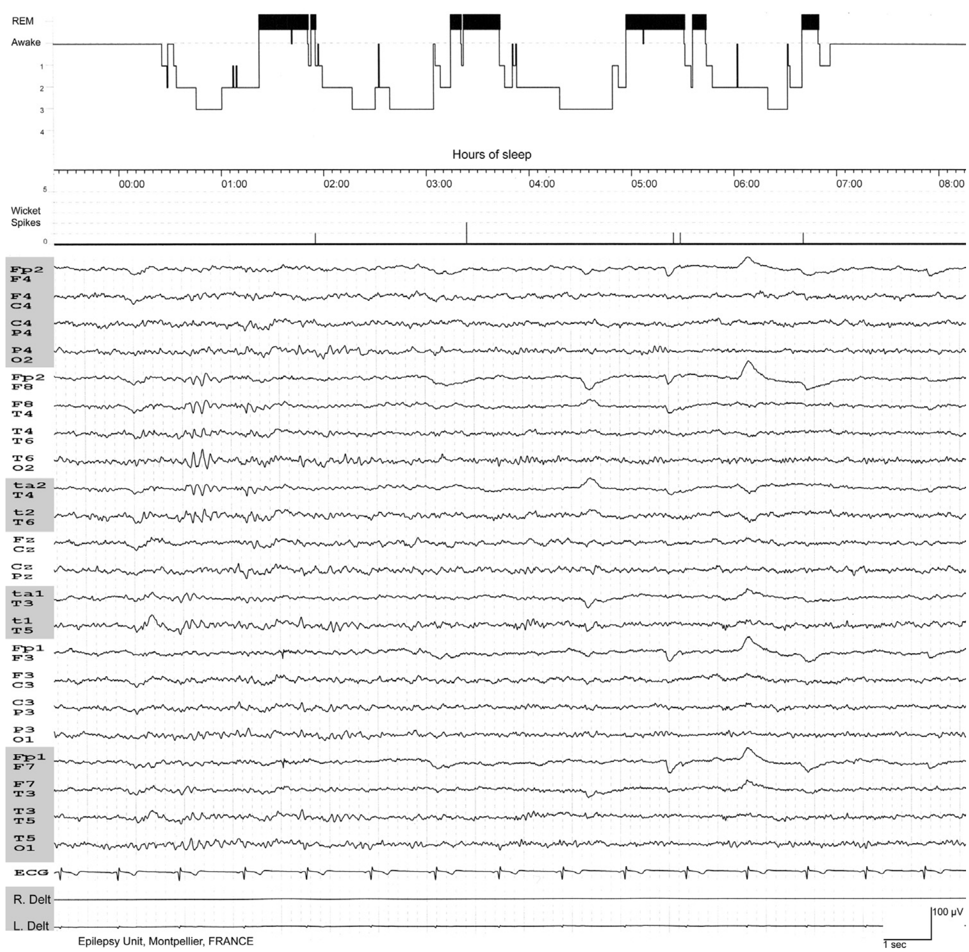

Figure 3 Hypnogram. Wicket spikes seen exclusively during REM sleep. EEG with international 10—20 electrode system with supplementary anterior/inferior temporal electrodes (TA1, T1, TA2, T2); right deltoid; left deltoid. REM sleep with rapid eye movements over the fronto-polar derivations. At the beginning of the plate, wicket spikes over the right temporal region.

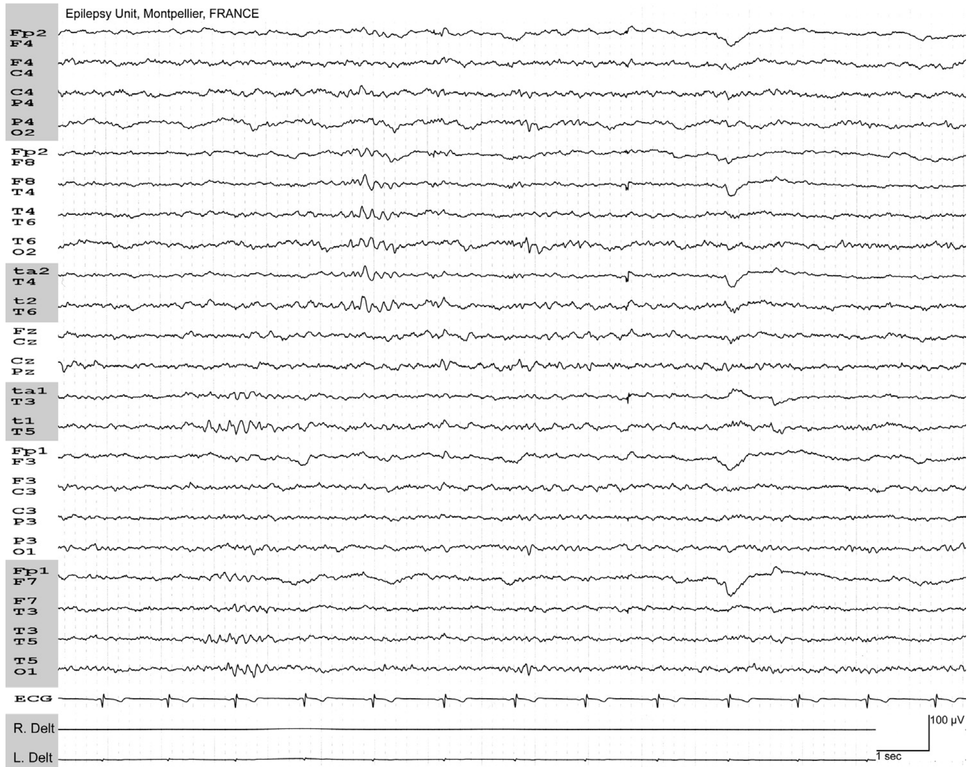

Figure 4 Same patient as on Fig. 3. REM sleep with wicket spikes over the right and left temporal regions.

Individual Contribution

Dr Serafini - Acquisition of data - Analysis and interpretation- Critical revision of the manuscript for important intellectual content.

Dr. Crespel - Study concept and design- Acquisition of data- Critical revision of the manuscript for important intellectual content.

Dr. Velizarova - Acquisition of data - Analysis and interpretation.

Dr Gelisse - Study concept and design - Acquisition of data- Analysis and interpretation - Critical revision of the manuscript for important intellectual content - Study supervision.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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